Chd1 regulates open chromatin and pluripotency of embryonic stem cells.

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Public Summary:

Scientific Abstract:
An open chromatin largely devoid of heterochromatin is a hallmark of stem cells. It remains unknown whether an open chromatin is necessary for the differentiation potential of stem cells, and which molecules are needed to maintain open chromatin. Here we show that the chromatin remodelling factor Chd1 is required to maintain the open chromatin of pluripotent mouse embryonic stem cells. Chd1 is a euchromatin protein that associates with the promoters of active genes, and downregulation of Chd1 leads to accumulation of heterochromatin. Chd1-deficient embryonic stem cells are no longer pluripotent, because they are incapable of giving rise to primitive endoderm and have a high propensity for neural differentiation. Furthermore, Chd1 is required for efficient reprogramming of fibroblasts to the pluripotent stem cell state. Our results indicate that Chd1 is essential for open chromatin and pluripotency of embryonic stem cells, and for somatic cell reprogramming to the pluripotent state.